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ABSTRACT

A math teacher describes an approach to help special education students solve addition and subtraction problems through a system involving finger counting. The systems for subtraction and addition solve the problem faced by students unable to memorize facts and unable to use their fingers when numbers exceeded five. (Illustrations of the approach are given, with sample problems and activities appended.) (CL)

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COUNTING SYSTEM FOR ADDING AND SUBTRACTING USING THE BASIC FACTS

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COUNTING SYSTEM FOR ADDING AND SUBTRACTING
USING THE BASIC FACTS

by

Philip L. Mackall

THE PROBLEM: Students in my math class were not succeeding at adding and/or subtracting at the basic facts level when one or both numbers were greater than 5. They were not able to memorize the facts. They had a counting system using their fingers, but it broke down when both numbers were above 5, and sometimes when only one number exceeded 5.

THE SOLUTION: Teach a system that would eliminate the breakdown that happens in the old system. The "down-down" system for subtraction and the "up-down" system for addition solve this problem in most cases.

ENTERING BEHAVIOR: The student must be able to count from 0 to 18 and from 18 to 0 on both hands, using the manual communication format for the numbers.

MATERIALS: hands
chalk and chalkboard or paper and pencil
posters
dittos
cards
game board
green and red rubber bands

PROCEDURE:

I. Teach the student to count down to 0 or up to 18 beginning at a given number. (Make sure to do this activity with each hand.)

a. through the air stimulus

Teacher says	Student says
5 up	5, 6, 7, ...18
12 down	12, 11, 10...0

b. written stimulus

Teacher writes on the board or paper	Student says
5 ↑	5, 6, 7, ...18
12 ↓	12, 11, 10, ...0

At this level you will need the chalk and chalkboard or the paper and pencil. You may need the poster with the numbers from 0 to 18 and the up and down arrows (See Appendix A).

II. Teach the student to go down-down on two hands, using an alternating rhythm. Notes:

1. Start the student on one hand--always start on that same hand. I always start on the left hand because it mirrors the first number in a written math sentence.
2. Stop when the second hand hits zero. The student may have trouble knowing which hand to start with and which to stop with. One aid for this is a green rubber band on the wrist of the "starting" hand and a red one on the wrist of the "stopping" hand. The student may also have trouble maintaining the rhythm. One solution is to "hit" the first number hard when changing it.
3. In the beginning keep numbers below 5; then below 10; then up to 18.

Teacher writes on the board or paper	Student counts
5 ↓ 3 ↓ =	Start
	5 ↘ 3
	4 ↘ 2
	3 ↘ 1
	2 ↘ 0 Stop

In this example the 2 remains on one hand. The student should write the 2 after the equals sign.

Teacher writes on the board or paper	Student counts
8 ↓ 6 ↓ =	Start
	8 ↘ 6
	7 ↘ 5
	6 ↘ 4
	5 ↘ 3
	4 ↘ 2
	3 ↘ 1
	2 ↘ 0 Stop

Two remains on one hand. The student writes it after the equals sign. At this level you will need chalk and chalkboard or pencil and paper. You may need the ↓↓ chart. You may use the ↓↓ cards and the game board and the ↓↓ dittos for reinforcement (see Appendix A).

At this point you have two options, depending on your goals for the students and the students' abilities.

- relate the ↓↓ system to the subtraction sentence (III below)
- teach the ↑↓ system (IV below)

III. Teach the student to use the ↓ ↓ system when he or she is given a subtraction sentence.

a. Transition

Teacher writes on the board or paper	Student counts
5↓ - 3↓ =	Start
	5 ↘ 3
	4 ↘ 2
	3 ↘ 1
	2 ↘ 0 Stop

The student writes 2 after the equals sign.

b. End product

Teacher writes	Student counts
5 - 3 =	(same as above)

(You may need to write the arrows in a few times as a reminder.)

At this level you will need chalk and chalkboard or pencil and paper. You should not need the ↓ ↓ chart any more. You may use the 5↓ - 3↓ cards as well as the corresponding dittos.

IV. Teach the student to count up-down on two hands, using the alternating rhythm.

Teacher writes on the board or paper	Student counts
5 ↑ 3 ↓ =	5 ↘ 3 ↘ 6 ↘ 2 ↘ 7 ↘ 1 ↘ 8 ↘ 0

(The procedures are the same as for ↓ ↓ .)

At this level you will need chalk and chalkboard or pencil and paper. You may need the ↑ ↓ poster. You may use the ↑ ↓ cards and the game board and the ↓ ↓ dittos for reinforcement.

V. Teach the student to use the ↑ ↓ system when given an addition sentence.

a. Transition

Teacher writes	Student counts
5 + 3 =	same as IV above

b. End product

Teacher writes	Student counts
5 + 3 =	same as above

Once again use appropriate cards and games for reinforcers.

VI. If you have not already faced the problem of confusion with the + and the -, now is the time. The problem can usually be solved by referring the student to charts that say "+ = ↑ ↓ " and "- = ↓ ↓ ". If you need reinforcement, mix the ↓ ↓ and ↑ ↓ cards.

SOME ADDITIONAL COMMENTS: Some students began to move both hands simultaneously. I then began to demonstrate this procedure incidentally in class with other students. Only a few more mastered this trick.

One student was unable to handle the above methods. A chart with his hands on it solved the problem. He located the two numbers on the chart and then "walked" up and/or down with his hands.

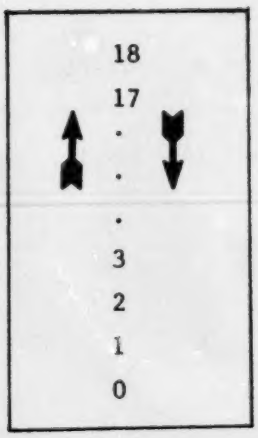
Students differed in time required for mastery of this technique. Some took a few weeks; some, a few months; a few, a year. It's not a panacea. My failures were with students who had other systems that worked for them--even though their systems were slower and more tedious.

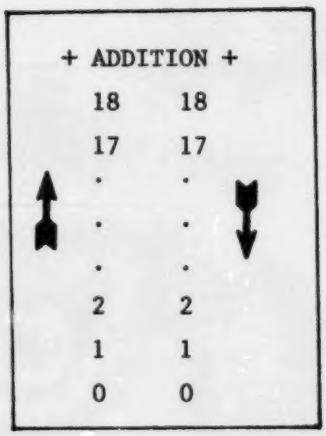
This system was originally used with students who were unable to master the traditional methods for adding and subtracting. I now use it for all my students who are learning these two processes.

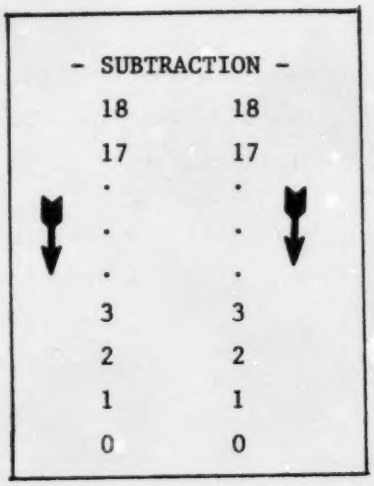
Since this system was developed for students with difficulty in adding and subtracting, I also introduced them to the use of the calculator. Whenever they completed a dittoed sheet with plus and minus signs, they checked their work with a calculator.

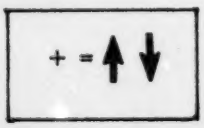
APPENDIX A

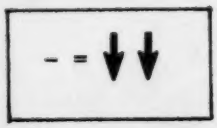
POSTERS



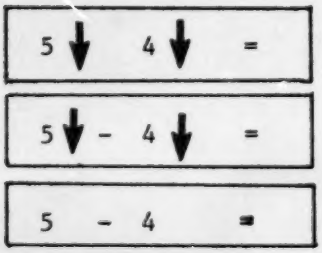


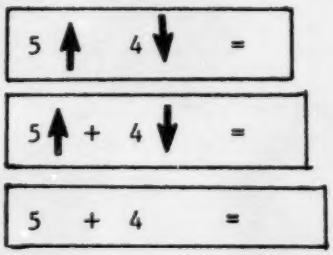






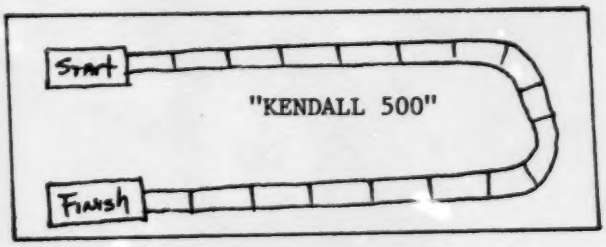
CARD TYPES: (Note: the answer can be written on the back to make the card self-checking)





GAME BOARD:

(Use toy cars as markers)



APPENDIX B

Can/Can't

or

"Subtraction With/Without Regrouping"

Here's an idea to help you teach subtraction with regrouping. The student who has completed this task should know when to regroup and when not to. (At this level the child is not expected to perform the subtraction computations.)

MATERIALS: 4 tin cans
4 labels
counters (I used poker chips)
die cut cards or index cards
a magic marker
overhead projector pen
laminating machine or contact paper

MATERIAL PREPARATION:

I. Make four labels: Can
Can't
Leave
Cross Out

II. Put one label on each can.

III. Make 3 decks of cards.

a. Can or Can't

Write problems like these on one side of each card.

5	2	6	4	0	4
-3	-8	-5	-9	-3	-0

Writing Can or Can't on the back of each card helps later separations, if decks should get mixed together.

b. Leave or Cross Out

Write problems like these:

80	56	75	49
-9	-4	-6	-3

Write Leave or Cross Out on the back of each card.

c. Leave or Cross Out

Write problems like these:

95	63	59	70
-28	-42	-20	-39

Write Leave or Cross Out on the back of each card.
Using a second color deck will help later separations.

IV. Laminate the cards, if possible, or cover with clear contact paper.

PROCEDURE:

I. Use the Can and Can't cans, the Can or Can't cards, and the markers.

1. The student
   a. Picks a card and reads it.
   b. Gets markers equal to the number in the minuend on the card.
   c. Takes away the number of markers in the subtrahend.
   d. Says can if he could subtract the subtrahend, and puts the card in the can can.
   e. Says can't if he could not subtract the subtrahend, and puts the card in the can't can.
2. The student goes on to the next card, using procedure II until all the cards are in the cans.
3. The teacher checks the cards and helps the student with mistakes. The procedure should be repeated until most of the cards are correct.

4. When the student can do the task with the markers, have him or her do the task without markers.

II. Go to the first set of Leave or Cross Out cards. The student should not need markers at this point.

1. The student
   a. Picks a card and reads it.
   b. Covers over the tens column and decides Can or Can't.
   c. If Can, he "leaves" it alone and puts the card into the Leave can.
   d. If Can't, he crosses out the two numbers in the minuend with an overhead pen and puts the card in the Cross Out can.
2. The student continues until all the cards are in the cans. The teacher checks.

III. At this point you can stop and teach the rest of the process of subtraction with regrouping: i.e., the regrouping and recording; and the subtracting and recording; or you can go on to the third deck, using the procedure in II.

Note: These same decks can be used as practice problems for the students or incorporated into a group game.